



PHENIX TEC OPERATIONS IN THE PEH

PHENIX Procedure No. PP-2.5.2.6-02

Revision: E

Date: 1/28/2013

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
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Engineer /Activity Manager Date

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REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	5/8/2000	n/a	E. O'Brien, J. Haggerty, W. Lenz, Y. Makdisi	n/a
C	Completely rewritten and updated. No record of rev. B is available	11/29/2004	n/a	D. Lynch, R. Pisani, P. Gianotti	R. Pisani
D	Reviewed and found to be procedurally up-to-date. Changed attachment A from specific experts list to generic web link to current list.	11/17/2009	D. Lynch	P. Giannotti, D. Lynch, R. Pisani	R. Pisani
E	Made Inactive. TEC not currently in use	1/28/2013	D. Lynch	P. Giannotti, D. Lynch, R. Pisani	R. Pisani

1. Purpose

The purpose of this document is to define the local emergency plan for operation of the High Voltage (HV) and Low Voltage (LV) Systems for the PHENIX Time Expansion Chamber (TEC). A separate document, OPM PP-2.5.2.6-06, covers the the operation of the gas system. In addition to the Local Emergency Plan this document specifies the Operating Procedures of the Time Expansion Chamber. This Local Emergency Plan will ensure:

- 1.1 the safety of all personnel from risks associated with the operation of the HV or LV systems required for running the Time Expansion Chamber*
- 1.2 the implementation of the appropriate emergency procedures,*
- 1.3 prompt notification of the appropriate C-A and S&EP specialists,*
- 1.4 the maintenance of appropriate C-A emergency status,*
- 1.5 the preservation and protection of the environment, and*
- 1.6 the preservation of BNL facilities and equipment.*

2. Responsibilities

During PHENIX operations there will be two levels of responsibility for the oversight of the TEC HV and LV systems: the PHENIX shift crew and the TEC experts.

The first level of responsibility resides with the PHENIX Shift Crew. During any period when the TEC has flammable gas flowing or HV on, there will be a minimum of two people on continuous shift in the PHENIX counting house. Once data taking has begun the number of people on shift at PHENIX increases to five. The second level of responsibility resides with the TEC experts. The TEC experts will be on-call to respond to any alarm or unusual occurrence detected by the PHENIX shift crew.

During watch shifts or data taking, it will be the responsibility of the PHENIX Shift Crew to:

- 2.1 monitor the status and alarms for the gas and HV system.*
- 2.2 In the event of an alarm or unusual occurrence, contact person expert from the Expert Call List given in Appendix A, or the current RUN web page.*

The second level of responsibility is the TEC experts. It is the responsibility of the TEC experts to:

- 2.3 maintain the TEC HV Systems in a safe operating condition. This includes*
 - 2.3.1 verifying the readiness of the chamber for HV,*
 - 2.3.2 setting, adjusting and maintaining the TEC HV,*
 - 2.3.3 turning on the HV according to the operating procedures described below,*
 - 2.3.4 posting any special instructions or notifications as required, and*
 - 2.3.5 carrying out any emergency actions, as prescribed in the Procedures section of this document.*

2.4 *maintain the TEC LV Systems in a safe operating condition. This includes:*

- 2.4.1 *verifying the readiness of the TEC electronics for LV,*
- 2.4.2 *setting, adjusting and maintaining the TEC LV settings*
- 2.4.3 *posting any special instructions or notifications as required, and*
- 2.4.4 *carrying out any emergency actions, as prescribed in the Procedures section of this document.*

3 Prerequisites

The TEC Gas, HV and LV experts shall have read or have training in the following area:

- 3.1 *PHENIX Local Emergency Plan, RHIC-OPM 3.16,*
- 3.2 *BNL Compressed Gas Safety Training Course,*
- 3.3 *BNL Electrical Safety I,*
- 3.4 *PHENIX awareness training.*
- 3.5 *BNL Hazard Communication*
- 3.6 *BNL General Employee Training*

4 Precautions

The safety of personnel is of primary importance. The TEC experts shall take great care to ensure that the TEC High Voltage and Low Voltage Systems will be operated in a way that does not place personnel or equipment at risk of physical harm.

4.1 *HV and LV System Precautions:*

- 4.1.1 *The total energy stored in the TEC with High Voltage on is low, ~ 10 mJoules, adjusting the voltage is not dangerous from a personal safety stand point. Additionally, all HV points are covered on the TEC such that one would have to remove covering material in order to feel any shock. However, there is significant risk of damaging the equipment, the TEC, without proper operation of the HV.*
- 4.1.2 ***Before any HV can be turned on, sufficient operating gas must have flowed through each of the detectors for 4 volume exchanges. The total gas volume of all TEC planes on the East carriage is 6000 liters. The TEC HV is to be turned on only by a TEC HV expert with current training. An exception is listed in 4.1.6. Please refer to OPM PP-2.5.2.6-06 for details***
- 4.1.3 *All HV controls associated with the TEC HV system are to be operated ONLY by designated TEC HV experts or by the PHENIX shift leader following specific instructions from TEC experts.*
- 4.1.4 *Any reconfiguration or adjustment to the TEC HV system in the PHENIX IR is to be performed ONLY by TEC HV experts with current training.*
- 4.1.5 *Any reconfiguration of the TEC LV beyond turning the power on/off is to be performed by TEC LV experts or people specifically designated for the job.*

5 Emergency Procedures

5.1 In the event of a fire or emergency in Building 1008, members of the PHENIX Shift Crew shall (in order of priority)

5.1.1 Follow emergency procedures described in C-A OPM 3.16 for the PHENIX area.

5.1.2 All TEC HV should be turned off by the PHENIX shift crew or TEC experts..

5.1.3 Confirm that the TEC Gas System is in safe/purge mode, Refer to OPM PP-2.5.2.6-06.

6 Standard Operating Procedures

There are three elements to the TEC Operating Procedures. The first element covers running gas to the chambers which can be found in OPM PP-2.5.2.6-06. The second covers the high voltage system for the chambers and the third element covers TEC LV controls. These Procedures shall be carried out by TEC Gas, HV and LV experts only.

The procedures for operating the TEC HV and LV systems are described in general terms in this OPM. A more detailed description of the TEC Gas system and its operation can be found in OPM PP-2.5.2.6-06 and the *PHENIX Central Tracking Gas System Design and Specification Manual (March 2000)*, especially see the section on the Alarm System in this document. The TEC Gas system experts will have familiarized themselves with this document.

6.1 HV System Procedures: Turning on HV:

If the HV is being turned on the first time, verify by checking with TEC Gas experts that operating gas has been flowing to the TEC for a minimum of 4 volume turnovers . The TEC can be damaged if the HV is turned on without the chambers containing the proper gas mixture. See OPM PP-2.5.2.6-06.

Check that the appropriate current limits are in place for the power supply. These limits are given in Attachment C. The TEC HV experts shall maintain a HV logbook where the operating parameters of the HV settings are recorded. This shall include the current limits, target voltages, ramp rates, operating voltages and currents, and trip tolerances.

6.1.1 Start the HV control program for the TEC in the PHENIX Counting House.

6.1.2 Check that the current limits, ramp rates and trip tolerances are set in accordance with the values in the TEC HV logbook.

6.1.3 Check that the target voltage for each HV output line is appropriate (50 volts). The first stage of bringing on the HV shall be a single increment in the ramp up. This is because the current trips are disabled during ramping, and in order to locate a short in the system, it is necessary to halt the ramping and check the current at the earliest possible stage.

6.1.4 Check that the ramp up rate for each HV supply is appropriate (50 volts per step).

6.1.5 Ramp up the HV to 50V to test for electrical shorts.

6.1.6 If HV current stays low, < 1 microamp, set initial voltages on computer control.

- 6.1.7 *Begin ramping Drift Window and Anode HV. Set Drift Window HV to logbook setting. Set Anode Voltages to 200V below logbook settings. Leave WC2 and BW off, they are not used.*
- 6.1.8 *Inspect current draw on HV computer screen. If any channel has 5 microamps current draw after 5 minutes reduce the HV setting on that channel by 100V and wait for the current draw to drop. **Any channels exempted from the 5 microamp limit will be identified by the TEC HV experts and noted in the TEC HV logbook.***
- 6.1.9 *Leave the HV at these settings for 1 hour.*
- 6.1.10 *If current draw is stable after 1 hour increase the anode voltage by 50 volts and repeat steps 6.1.8, 6.1.9 until reaching the HV values noted in the log book.*
- 6.1.11 *If at any point during this procedure there is a HV trip determine the reason for the trip and return to step 6.1.3 for that channel. It may be necessary to reduce all voltages on a particular TEC chamber prior to restarting the HV ramp-up procedure on that chamber.*
- 6.1.12 *If HV trips occur during normal TEC operation determine the cause of the trip and restore the tripped channel to 50V below its most recent operating value. Wait a sufficient amount of time to allow the current to stabilize. Restore the channel to its logbook value. If the channel continues to trip at the logbook value reduce that channels HV operation setting by 50V and make a note in the TEC HV logbook.*
- 6.1.13 *Once all TEC HV channels have been set to the appropriate TEC HV logbook values or their new modified values, monitor all channels for the operating current and HV trips. Keep a record of all TEC HV actions, especially unusual occurrences in the TEC HV logbook*
- 6.1.14 *The TEC is ready for HV operation.*
- 6.2 *HV System Procedures: Turning off High Voltage to a chamber:*
 - 6.2.1 *Begin ramping down the HV.*
 - 6.2.2 *Verify by the read back that the HV is off the system.*
 - 6.2.3 *In the event of irregularities, call a TEC HV expert.*
- 6.3 *LV System Procedures: Turning on Low Voltage:*
 - 6.3.1 *Go to LV control computer in the PHENIX Counting House*
 - 6.3.2 *Go to PHENIX Rack Control and Monitor page and turn on the appropriate TEC racks.*
 - 6.3.3 *Verify that the AC is on to the LV crate.*
 - 6.3.4 *Turn on one rack of LV supplies at a time powering the G-P and F supplies in the proper sequence as specified by the TEC experts. **The sequence the TEC LV supplies are turned on is very important for the proper operation of the TEC electronics.***
 - 6.3.5 *Verify that the LV supplies have come on by monitoring their status on the TEC LV control page. If the LV will not come on in some particular channel call a TEC expert.*
 - 6.3.6 *It is also necessary to download the appropriate ARCNET initialization files, for details contact*

the TEC expert.

6.4 LV System Procedures: Turning off Low Voltage:

- 6.4.1 Click on the appropriate button on the TEC LV computer page to turn LV power off to the channels required.*
- 6.4.2 Verify that the power has turned off by monitoring its status on the TEC LV computer page.*

7 References

- 7.1. RHIC-OPM 3.0, "Local Emergency Plan for the Relativistic Heavy Ion Collider Project."*
- 7.2. BNL ES&H Health Standard, Section 1.4.0, "Compressed Gas Cylinder Safety", December 18, 1991.*
- 7.3. BNL Occupational Health and Safety Guide (Interim), Section 4.11.0, "Installation of Flammable Gas Systems (Experimental & Temporary Installations)", June 21, 1989.*

8. Appendix

- 8.1. Attachment A – TEC HV and LV System experts*
- 8.2. Attachment A – TEC HV settings and limits*

Attachment A: TEC HV and LV System Experts

Contact Information

Contact Information for experts for this subsystem can be found on the PHENIX Internal Website in the [RUN] link at: (NOTE: replace ## by the current run number)

https://www.phenix.bnl.gov/WWW/run/##/contacts/subsys_experts.html

General PHENIX contact info can similarly be found at:

<https://www.phenix.bnl.gov/WWW/run/##/contacts/>

Gas system experts can be found at:

http://phenix.bnl.gov/WWW/tracking/gas_system/people.html

In addition, the Run Coordinator and Shift leader for the current run shall have a paper copy available of the contact information for the appropriate systems experts for this and all other PHENIX subsystems.

Attachment B: TEC HV Settings

Each TEC plane has 4 separate channels of HV on the North and South side. The 4 bias voltages are Anode, Drift Window, Wire Cathode 2, and Back Window. The nominal voltages and currents for each chamber are:

Anode	+1600V
Drift Window	-3000V
Wire Cathode 2	off
Back Window	off
Current trip setting/channel	20 microamps
Ramping voltage steps	50 V

Note: For the actual voltage setting for each TEC HV channel refer to the TEC HV Logbook.